

REMARKSIN THE CLAIMS

Claims 1, 3, 4, 5, 8, and 12 are amended to better describe the Applicants' invention.

Claim 1 is AMENDED as follows:

In line 9 of the claim, a comma is ADDED AFTER the word "mask" and BEFORE the word "thereby" in order to correct punctuation and syntax.

In line 14 of the claim, the word "and" AFTER the semicolon ending the clause is DELETED as extraneous since this clause does not directly follow a final clause. The change is made to correct the form of the claim structure.

In line 16 of the claim, a comma is ADDED AFTER the word "layer" and BEFORE the word "thereby" in order to correct punctuation and syntax.

In line 18 of the claim, the word "and" AFTER the semicolon ending the clause is DELETED as extraneous since this clause does not directly follow a final clause. The change is made to correct the form of the claim structure.

In line 19 of the claim, AFTER the semicolon ending the clause, the word --and-- and a carriage return are ADDED. In newly ADDED line 20, the clause and period -- oxidizing the surfaces of the silicon substrate after the step of removing said photoresist. -- are ADDED to include the limitations of canceled Claim 2, and to properly end the sentence. The change is made to better describe the claimed invention.

Claim 2 is canceledClaim 3 is AMENDED as follows:

In line 2 of the claim, the use of the word "a" BEFORE the words "industry standard" is DELETED and REPLACED with the word --an-- in order to correct sentence syntax.

Claim 4 is AMENDED as follows:

Again in line 1 of the claim, the word “wherein” is DELETED and REPLACED with the words -- further comprising --; and the word “said” BEFORE the words “metal layer” is DELETED and REPLACED with the word -- a --. The change is made to correct antecedence and better describe the invention. Support for the former change is found at page 8, lines 3 – 14 and FIG. 2C.

In line 2 – 4 of the claim the words “includes depositing a metal selected from the group consisting of the noble metal listed in New IUPAC Group Numbers 9, 10, or 11 of the Period Table of elements and alloys thereof”, BEFORE the period ending the sentence, are DELETED and REPLACED with the words -- onto said exposed areas and said electrically conductive layer, wherein said metal layer fills said plurality of etched trenches --. The change is made to simplify the claim and to better describe the invention. Support for the former change is found at page 8, lines 3 – 14 and FIG. 2C.

Claim 5 is AMENDED as follows:

In line 1 of the claim, the dependency of the claim is changed from Claim 1 to Claim 4; and the word “first” BEFORE the word “step” is DELETED in order to better describe the invention by correcting the antecedence of “depositing”.

Claim 6 is canceledClaim 7 is unchangedClaim 8 is AMENDED as follows:

In line 1 of the claim, the word “micron” is DELETED and REPLACED with the word -- microns --. The change is made to correct the spelling and syntax of the sentence.

Claims 9 and 10 are unchangedClaim 11 is canceled

Claim 12 is AMENDED as follows:

In line 1 of the claim, the dependency of the claim is changed from canceled Claim 2 to amended Claim 4. The change is made to better describe the invention by correcting the antecedence of the metal layer Markush group deleted from original Claim 4.

Claim 13 is unchanged

Claims 14 – 20 are canceled

NEW Claim 21 is ADDED as follows:

NEW Claim 21 is ADDED to read -- The method of claim 12, wherein said step of depositing includes depositing a layer of chromium followed by depositing a layer of gold. -- The change is made to place this claim in a more logical sequence. Support is found in canceled Claim 6.

Applicants assert that No New Matter was introduced as the result of the foregoing amendments.

IN THE SPECIFICATIONAT PAGE 1

In line 18, the words "and/or during" are DELETED and REPLACED with the words -- and/or due -- in order to correct sentence syntax.

AT PAGE 2

In line 10, a comma is ADDED AFTER the word "radiation" to correct sentence punctuation.

In line 13, the word "skill" is DELETED and REPLACED with the word --skilled-- in order to correct sentence syntax.

In line 17, the hyphenated words "deeply-extending" are DELETED and REPLACED with the un-hyphenated words -- deeply extending -- in order to correct sentence punctuation.

In line 17, the words "two stage" are DELETED and REPLACED with the hyphenated words -- two-stage -- in order to correct sentence punctuation.

AT PAGE 3

In line 10, a comma is ADDED AFTER the word "deposited" to correct sentence punctuation.

AT PAGE 4

In line 18, the word "has" is DELETED and REPLACED with the word -- have -- to correct sentence syntax.

In line 25, the words -- have been -- are ADDED AFTER the words "silicon micro-mold" to correct sentence syntax.

AT PAGE 5

In line 12, the word "provide" is DELETED and REPLACED with the word -- provides --; and the word "features" is DELETED and REPLACED with the word -- feature --. The changes are made to correct sentence syntax.

In line 15, the word "overcomes" is DELETED and REPLACED with the word -- overcome -- to correct sentence syntax.

In line 16, the word "a" is DELETED and REPLACED with the word -- an -- to correct sentence syntax.

In line 20, a comma is ADDED AFTER the word "removal" to correct sentence punctuation.

AT PAGE 6

In line 12, the word "a" is DELETED and REPLACED with the word -- an -- to correct sentence syntax.

In line 14, a comma is ADDED AFTER the words "silicon surface" to correct sentence punctuation.

In line 16, a comma is ADDED AFTER the word "applied" to correct sentence punctuation; and the word -- and -- is ADDED AFTER the word and comma "cured," to correct sentence syntax.

In line 18, the comma AFTER the words "lithographic process" is DELETED and REPLACED with a period to end the sentence and the word "such" following the deleted comma are DELETED and REPLACED with the words -- These processes may include using -- to correct sentence syntax.

In line 19, a space AFTER the opening parenthesis and BEFORE the word "and" is DELETED to correct sentence structure.

In line 20, the word "a" BEFORE the words "direct "writing"" is DELETED and REPLACED with the words -- or by using a -- to correct sentence syntax.

In line 20, a comma is ADDED AFTER the word “technique” to correct sentence punctuation.

In line 22, the word and commas -- , however, -- are ADDED AFTER the words “silicon micro-mold” to correct sentence syntax.

In line 25, the word “helps” is DELETED and REPLACED with the word -- help -- to correct sentence syntax.

In line 27, the word -- are -- is ADDED AFTER the word “resist” to correct sentence syntax.

AT PAGE 7

In line 19, the hyphenated words “processing-protection” are DELETED and REPLACED with the un-hyphenated words -- processing protection -- in order to correct sentence punctuation.

In line 22, the word -- to -- is ADDED AFTER the word “etchant” in order to correct sentence syntax.

AT PAGE 9

In line 4, the word “having” is DELETED and REPLACED with the word -- have -- to correct sentence syntax.

In line 6, a comma is ADDED AFTER the words “In particular” to correct sentence punctuation.

In line 10, the words “is applied” are DELETED to correct sentence syntax.

In line 17, the word -- or -- is ADDED AFTER the comma and word “deposition” in order to correct sentence syntax.

AT PAGE 10

In line 1, the word "a" is DELETED and REPLACED with the word -- an -- to correct sentence syntax.

In line 2, a comma is ADDED AFTER the number "15" to correct sentence punctuation.

In line 7, the comma AFTER the words "broadband light" is DELETED to correct sentence punctuation.

In line 10, the second set of duplicated words "of the" are DELETED to correct sentence syntax.

In line 15, the comma AFTER the word "standard" is DELETED to correct sentence punctuation.

In line 20, the comma AFTER the word "possible" is DELETED and REPLACED with a semicolon to correct sentence punctuation.

In line 27, the word "etch" is DELETED and REPLACED with the word --etched-- in order to correct sentence syntax.

AT PAGE 11

In line 1, the word "are" is DELETED and REPLACED with the word -- is -- to correct sentence syntax.

In line 2, the words "two stage" are DELETED and REPLACED with the hyphenated words -- two-stage -- and a comma ADDED AFTER the newly amended words "two-stage" to correct sentence punctuation and syntax.

In line 2, a comma is ADDED AFTER the number "15" to correct sentence punctuation.

In line 26, the word "form" is DELETED and REPLACED with a comma and the words -- , thereby forming -- in order to improve sentence syntax.

AT PAGE 12

In line 8, the space AFTER the word "flat" and BEFORE the comma is DELETED to correct sentence structure.

AT PAGE 16

In lines 1 and 2, the words "fabricating an x-ray mask tool which can achieve pattern features having lateral dimension of less than 1 micron" are DELETED and REPLACED with the words - - rapidly fabricating a robust 3-dimensional silicon micro-mold for use in preparing complex metal micro-components - - to better describe the invention. Support for the change is found at page 5, lines 7 – 9 of the Applicant's written description.

Applicants assert that No New Matter has been introduced as the result of the foregoing amendments.

OBJECTION TO THE SPECIFICATION***Examiner's §1 – 3***

Examiner objects to the specification in that:

“The abstract of the disclosure is objected to because the first sentence thereof does not correspond to the invention described in the specification. Specifically, the first sentence of the abstract states the present invention describes a method for fabricating an x-ray mask tool which can achieve pattern features having lateral dimensions of less than 1 micron, however the present specification does not teach or describe an x-ray mask tool, or a method of making the same. As set forth in the title, specification, drawings, claims, and lines 3-12 of the abstract, the present invention is drawn to a silicon micro-mold and a method of making the same. It appears that the first sentence of the abstract is a reference to the subject matter of the parent application, of which the present application is a continuation-in-part.”

Examiner requires correction. See MPEP § 608.01(b).

Applicants' Response

Applicant thanks the Examiner for his remarks and apologizes for the oversight in not correcting the Abstract when the Continuation-in-Part Application was initially filed.

Applicant has requested that the first line of the Abstract be amended in order to clarify the subject matter which is being claimed. Applicant now believes that the re-phrased Abstract fairly describes the invention being claimed as required by MPEP §608.01(b).

By amending his Specification in this way, Applicant believes that he has removed the source of confusion in the Abstract and cured the informality objected to by the Examiner. Applicant, therefore, respectfully requests that the Examiner reconsider and withdraw his objections and pass the Application to allowance.

REJECTION UNDER 35 U.S.C. §112

Examiner's §3

Claims 1 – 20 are pending in the application.

Claims 4 – 6, and 11 – 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In particular, the Examiner notes:

“Claims 4 and 12 each recite the limitations "the step of depositing" and "said metal layer" in line 1. There is insufficient antecedent basis for these limitations in the claims.

Claims 5 and 11 each recite the limitation "the first step of depositing" in line 1. There is insufficient antecedent basis for this limitation in the claims.

Claim 6 recites the limitation "said step of deposition" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim 13 recites the limitations "said step of depositing" and "said metal layer" in line 1. There is insufficient antecedent basis for these limitations in the claim.”

Applicants' Response

Applicant thanks the Examiner for his remarks and again apologizes for the poor claim drafting.

Applicant has amended Claims 4, 5, and 12 and canceled Claims 6 and 11 in order to correct the antecedent informalities noted by the Examiner. Claim 4 is amended to recite the “step of depositing” as a new and subsequent step following the process of Claim 1; and Claims 5 and 12 are amended to depend from amended Claim 4.

REJECTION UNDER 35 U.S.C. §103(a)

Examiner's §4

Claims 1 – 20 are pending in the application.

Claims 1 – 13 are rejected under 35 U.S.C. 103(a), as being unpatentable over:

“ “OEM technique: a new three-dimensional micro fabrication technique for non-silicon materials” by Chen et al. [reference CI of the Information Disclosure Statement filed 2/26/02] (Chen CI) in view of “New type X-ray mask fabricated using inductively coupled plasma deep etching” [reference CL of the Information Disclosure Statement filed 2/26/02] (Chen CL). Chen CI discloses a Deep etching, Electroforming, Microreplication (OEM) technique for micro fabrication comprising sputtering a metallic layer on the backside of a silicon wafer, conducting a silicon deep etching process through the wafer from the front side utilizing a patterned SiO₂ layer as an etching mask to selectively uncover the metallic layer, and electroforming. See the abstract, and “process method B” set forth at page 1101, lines 12-17 and Figure 3. Furthermore, Chen CI refers to Chen CL for a discussion of the deep etching process. See page 1099, lines 6-7 of the Introduction section. However, Chen CI does not disclose patterning the SiO₂ etch mask layer by providing a photoresist layer, and imaging the photoresist layer through a mask.”

“Chen CI discloses a silicon deep etching process comprising the steps of forming an oxide layer on a silicon wafer, spin-coating a resist on the oxide layer, patterning the resist by photolithography, etching the SiO₂ layer through the resist, and deep etching the silicon wafer through the patterned SiO₂ layer. See the abstract, and section 3 “Fabrication process”. It would have been obvious to one skilled in the requisite art to utilize a photoresist to pattern SiO₂ layer, as taught by Chen CL, in the process of Chen CI because is taught that spin coating a resist on a SiO₂ layer, imaging the resist, and etching the SiO₂ layer through the patterned resist provides for a patterned SiO₂ layer useful as a etch mask for anisotropically deep etching an underlying silicon wafer.”

Applicants' Response

Applicant again thanks the Examiner for his remarks but must respectfully disagree with his conclusion.

Regarding Claims 14 – 20, Applicants have requested that these claims be canceled and their rejection is therefore mooted in the present action.

Regarding Claim 1, Applicant notes that his invention recites oxidizing the sidewalls of newly formed “etched trenches” as a key step for releasing the metal article once formed by depositing a metal layer inside the etched trenches (see page 11, lines 20 – 24 of Applicant’s written description and FIG. 2B). Reference CL (Chen, et al. 2001) make no reference to this feature/step, and while reference CI (Chen, et al. 1999) discusses such a feature/step in their Process A it is specifically excluded from Process B (see page 1101, line 15). Moreover, Process A of reference CI does not include the “conductive layer” recited by Process B and which is required by the Applicant’s invention (page 9, lines 14 – 22 of Applicant’s written description and FIGs, 1A – 2C).

As such, Applicant asserts that neither of the cited references describe Applicant’s Claim 1, now amended to include the limitations of canceled Claim 2. Applicants argue, therefore, that they now recite an invention that is neither taught nor suggested by Chen (CI) or Chen (CL), in that neither teach both a step of sidewall oxidation *and* forming a conductive layer as does the Applicant’s invention.

Regarding Claims 2 - 13, Applicants note that Claims 2, 6, and 11 have been canceled and as such their rejection in the present action is moot. Regarding remaining Claims 3, 4, 5, 7, 8, 9, 10, 12 and 13 and newly added Claim 21, because all of these claims ultimately depend from amended Claim 1, now shown to be unique and nonobvious, these also must be unique and nonobvious since, by definition, a dependent claim merely narrows the scope of the claim from which it depends.

Consequently Applicant asserts, that he has overcome the rejection under 35 U.S.C. §103(a) with respect to regarding Claims 1 – 13 in that by amending Claim 1, it and remaining Claims 3, 4, 5, 7, 8, 9, 10, 12 and 13 and newly added Claim 21 now claim

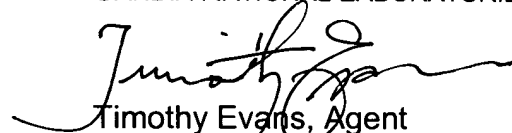
an invention neither described nor suggested by the prior art. Applicant, therefore, respectfully requests that the Examiner reconsider and withdraw his rejection of Claims 1, 3, 4, 5, 7, 8, 9, 10, 12 and 13 and newly added Claim 21 and pass these claims to allowance.

CONCLUSION

Applicant respectfully assert that by amending Claims 1, 4, 5, 8, and 12 the instant invention now claims a unique method that is neither suggested nor taught by the prior art. Applicants, therefore, respectfully request favorable reconsideration of the claims now presented and allowance of this application is earnestly solicited.

This response is:

Respectfully submitted by,
SANDIA NATIONAL LABORATORIES

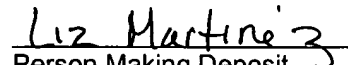
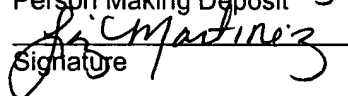

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CERTIFICATION UNDER 37 CFR 1.8

I hereby certify that this Transmittal is being deposited with the U. S. Postal Service on **JUNE 17, 2004**, in an envelope as First Class mail addressed to: Commissioner for Patents, Mail Stop Non Fee Amendment, P.O. Box 1450, Alexandria, VA 22313-1450

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